Synaptic alterations of human caudate nucleus in Alzheimer's disease.

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Research question and background

Neostriatum is one of the brain areas that are not primarily affected in Alzheimer's disease, according to classic regard of the disease. However, recent data emphasize the involvement of neostriatum, especially the head of caudate nucleus, in the emergence of characteristic symptoms of the disease. This data accomplish previous observations of the crucial role of caudate nucleus not only in motor functions but also in cognitive functions, behavior, mood and memory. The present study aims to reveal possible synaptic alterations on medium size spiny neurons of human caudate nucleus in Alzheimer's disease.

Methods and tissues used

Postmortem material from the neostriatum of 10 patients suffered from Alzheimer's disease and 10 age-matched healthy individuals were included in the study. The material was obtained from Netherlands Brain Bank and Brain Bank Munich, members of BrainNet Europe. Golgi silver impregnation technique was used for the comparison of the dendritic tree and the spinal density between the two groups. Immunohistochemistry for glutamate receptors (NMDA, AMPA and mGluR) revealed their distribution in the two groups and electron microscopy was used for the final comparison of the synapses in ultrastructural level.

Results and conclusion

The results show a decrease in spine number and dendritic density of the distal part of the dendritic tree on spiny neurons in Alzheimer's disease. Statistically significant differences were also observed in the distribution of metabotropic glutamate receptors and in the length of synapses in ultrastructural level. These results accomplish previous data about selective degeneration of large cholinergic interneurons in the striatum of Alzheimer's disease patients and reinforce the role of caudate nucleus in the regulation of cognitive functions.